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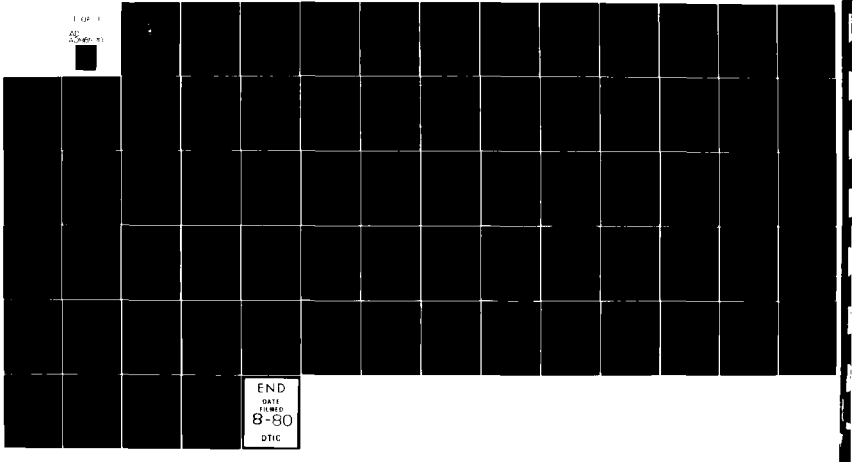

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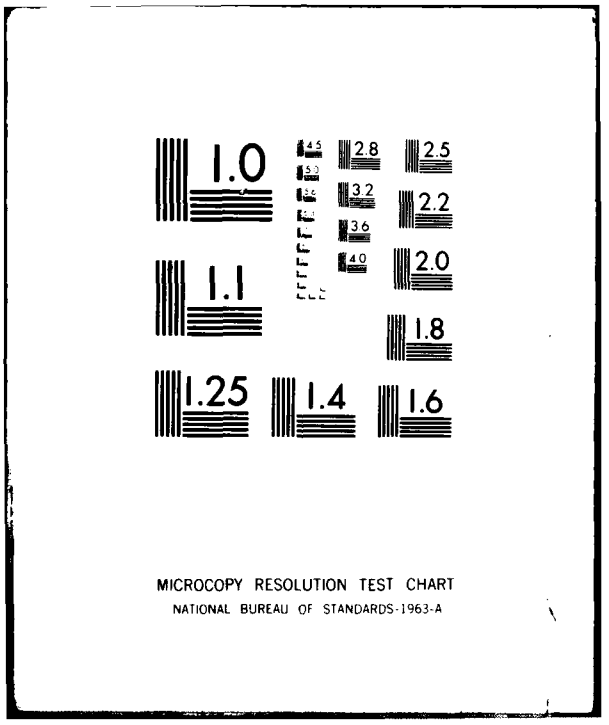
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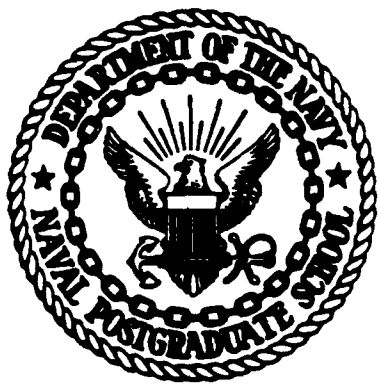

THESIS

ANALYSIS OF CENTRAL DESIGN AGENCY ALTERNATIVES FOR NAVY INDUSTRIAL FUND ACCOUNTING SYSTEMS: A PROPOSED METHODOLOGY.

by

Mark David Westin

March 1980

Thesis Advisor: D. J. Harr

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The task of design, implementation, and maintenance of automated Navy Industrial Fund accounting systems is the responsibility of the Central Design Agencies that serve each of the industrial activity groups. The perception that separately maintained automated accounting systems are not cost effective has led to calls for the consolidation of central design agency functions. The objective of this thesis was to assess the methodologies available for the analysis of the consolidation alternatives. While several studies

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Analysis of Central Design Agency Alternatives for Navy Industrial Fund Accounting Systems: A Proposed Methodology

by

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Submitted in partial fulfillment of the requirements for the degree of

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ABSTRACT

The task of design, implementation, and maintenance of automated Navy Industrial Fund accounting systems is the responsibility of the Central Design Agencies that serve each of the industrial activity groups. The perception that separately maintained automated accounting systems are not cost effective has led to calls for the consolidation of central design agency functions. The objective of this thesis was to assess the methodologies available for the analysis of the consolidation alternatives. While several studies have suggested a cost-benefit approach, this study concluded that this methodology was inappropriate due to its restrictive assumptions and severe measurement problems. This study suggests "scorecarding" as a more appropriate methodology and provides a "pro forma" scorecard dealing with the consolidation issue. Scorecarding is a preferred alternative for dealing with the multiple and conflicting objectives and the multiple impacts that characterize the central design agency consolidation issue.

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LIST OF ACRONYMS

ADP	automated data processing
CASDO	Computer Application Support and Development Office
CENO	Central NOMIS Office
CDA	central design agency
CNM	Chief of Naval Material
DOD	Department of Defense
FAC 151	NAVFAC office code 151
GAO	General Accounting Office
MILSEALIFTCOM	Military Sealift Command
MIS	management information system
MSDD	Management Systems Development Directorate
NARF	Naval Air Rework Facility
NAVAIR	Naval Air Systems Command
NAVCOMPT	Comptroller of the Navy
NAVFAC	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply Systems Command
NIF	Naval Industrial Fund
NMC	Naval Material Command
NOMIS	Naval Ordnance Management Information System
NPPS	Navy Publication and Printing Service
OMB	Office of Management and Budget
ONR	Office of Naval Research

ORDFAC	Naval Ordnance Facility
POLMISSLEFAC	Polaris Missile Facility
PWC	Public Works Center
PWCMS	Public Works Center Management System
RDT&E	Research, Development, Test, and Evaluation
SHYD	U.S. Naval Shipyard
SSPO	Strategic Systems Planning Office

I. INTRODUCTION TO THE STUDY

A. INTRODUCTION

Navy Industrial Fund (NIF) accounting systems are designed in accordance with policy guidance provided by the Comptroller of the Navy (NAVCOMPT). The volume and complexity of the NIF accounting function has led to automated data processing (ADP) to assist in the operation and management of the several NIF accounting systems used by the various NIF activities and activity groups. The task of design, implementation, and maintenance of these automated NIF accounting systems is the responsibility of the Central Design Agencies (CDAs) that serve each of the NIF activity groups. Continued improvements in ADP technology and the pressure to reduce management support costs has led to the perception that the maintenance of separate, automated NIF accounting systems by similar NIF activities is not cost effective. This view has generated considerable interest in the consolidation of NIF CDA responsibilities.

Several studies have expressed the view that costly duplication exists in the maintenance of the several NIF accounting systems supported by separate CDAs, and have suggested that there may be economies of scale to be realized from NIF CDA and accounting system consolidation. One such study, conducted by the Naval Supply Systems Command (NAVSUP) recommended that further economic analysis of the CDA consolidation issue

be conducted and proposed cost-benefit analysis as the appropriate methodology.

B. THESIS OBJECTIVE

The objective of this thesis is to assess the methodologies available for the analysis of central design agency alternatives for NIF accounting systems. As background, the features of NIF accounting and the NIF CDA organizational relationships and implications were examined. Three reports of studies conducted concerning the consolidation issue in the NIF community are presented and the reactions to them are discussed. The key characteristics and assumptions in the situation are identified and two alternative methodologies are examined; the *cost-benefit approach*, and a "scorecard" approach drawn from the literature of policy analysis. The methodology deemed more appropriate for the analysis of NIF CDA consolidation alternatives is presented.

C. APPROACH

The approach used in this thesis included a review of the literature pertaining to the Navy Industrial Fund, NIF accounting, and CDA relationships; analysis of studies and Naval correspondence concerning the NIF CDA consolidation issue; telephone discussion with personnel at the Naval Supply Systems Command, Washington, D. C.; and discussion with faculty members of the Naval Postgraduate School.

II. BACKGROUND OF THE STUDY

The major focus of this study is to propose a methodology to explore alternatives for the centralized design and development of Navy Industrial Fund (NIF) accounting systems. This chapter describes the Navy Industrial Fund and the major characteristics of its environment. Discussion of the key features of NIF accounting, and exploration of the significant organizational relationships, form a background to assist in understanding the strong interest that has been displayed in restructuring the role of a Central Design Agency (CDA) for the NIF accounting systems.

A. THE NAVY INDUSTRIAL FUND

One of the features of the 1949 amendments to the National Security Act of 1947 was the authorization for the Secretary of Defense to establish working capital funds for the capitalization of commercial and industrial-type activities. The industrial fund concept was part of an effort by the Congress to streamline and formalize the Department of Defense and promote efficiency and economy through the application of uniform budgetary and fiscal procedures. During the hearings that led to the creation of the industrial funds, the Congress felt that there was a lack of adequate accounting for costs among the commercial and industrial activities of the military departments. They concluded that the standard government

appropriation accounting did not provide for the simple, yet accurate, cost determination required for these activities. Under the existing federal budget and appropriation structure, projects undertaken by the military required financing from several different appropriations. The appropriations were often controlled and accounted for by geographically scattered and organizationally unrelated commands. Congress felt that the use of proven cost accounting practices within a working capital fund would eliminate the need for several appropriations to finance daily operations and promote greater economy efficiency and accountability [1;11-13]. The Department of Defense (DOD) established five industrial funds; one for each service, as well as a separate fund under DOD for the operation of agencies providing common user services across military departments. The largest and most diverse of these is the Navy Industrial Fund.

The Navy Industrial Fund is a working capital fund designed to simplify the financing of naval activities which perform industrial and commercial-type services for customer activities. Industrial services include the production, construction, modification, conversion, rehabilitation, overhaul, and maintenance of ships, aircraft, missiles, weapons, ammunition, vehicles, and other military equipment. Commercial activities perform services such as transportation, port terminal operations, printing, research and development, and engineering. Customers may include all types of commands at

all levels within the Navy, other military services, other government agencies, or selected private customers [1;10-11].

In fiscal year 1976, NIF activities had revenues of $5.7 billion. The passage of these funds through the NIF represented 18 percent of the Navy's total expenditures. NIF activities include shipyards, public works centers, ordnance plants, aircraft rework facilities, printing offices, ammunition depots, research and development activities, and the Military Sealift Command. These NIF activities employed 52 percent of the Navy's civilian workforce in fiscal year 1976. That same year, the Navy's basic dollar commitment to the fund, called the "corpus", was $366 million. The revenue represented an annual fund turnover rate of 15.6 times [2;6].

In order for a commercial or industrial activity to be financed from the Navy Industrial Fund, the Secretary of the Navy must request a "charter" for that activity from the Assistant Secretary of Defense (Comptroller). The operation of the activity is governed by this charter which is based on the Department of Defense Directive 7410.4, "Regulations Governing Industrial Fund Operations" [1;23-24].

B. BASIC NAVY INDUSTRIAL FUND ACCOUNTING FEATURES

The Navy Industrial Fund has its roots in the accounting concept of "fund" theory. The National Committee on Governmental Accounting has defined a fund as:

> An independent fiscal and accounting entity with a self balancing set of accounts and/or other resources together with all related liabilities, obligations, reserves, and

> equities, which are segregated for the purpose of carrying on specific activities or attaining certain objectives in accordance with special regulations, restrictions, or limitations. [3;3-4]

Thus the fund is a device to focus attention on the activities or operations of a particular management group and its associated accounting records. The fund may stand as a separate entity for management within a larger organizational framework.

As an industrial, working capital fund, NIF is a revolving fund where the resources of the fund are used to finance the work or services performed by the fund's various installations. When the job is completed, the customer is billed and the fund is reimbursed. The goal of DOD working capital funds is total cost recovery, generating neither profit nor loss [2;3].

There are several advantages in the use of working capital funds. The principal advantage is the creation of a "buyer-seller" relationship between the producer of the good or service and the customer activity. The notion of "free" supplies and services is eliminated because the customer is required to justify the expenditure of funds in the budget, thus forcing the customer activity to be more cost conscious. Other advantages include simplified financing, greater flexibility in utilization of the workforce, and the avoidance of unnecessary duplication of facilities. In addition, a "cost-per-unit" of the commodity or service produced is established. Theoretically, total costs should be lower because the customer

is in a position to keep track of the service units received, and complain if the billing is not correct [4;15].

The accounting system for NIF features double entry bookkeeping, accrual accounting, internal control over all transactions, and integration of the cost records with the general ledger accounts. While specific procedures vary with the type of activity, the basic policy is to use a job order cost system. Typically, direct costs (labor and material) are charged directly to the job order as the work is performed. Production related overhead is charged according to a predetermined overhead rate based on direct labor hours for the cost center. General and administrative overhead is applied on the basis of an activity-wide, predetermined rate. When a customer order is received by a NIF activity, it is assigned a unique job order number. All costs are accumulated against the job, and customer billings are based on the total costs [2;16-17].

Customers place orders for work or services from a NIF activity with either a project order or a work request. A project order is used if the work is specific and the dollar charge well defined. Funding authorized continues for the life of the project, such as a one time overhaul of an equipment. A work request is used for recurring work or services, such as utilities or photo processing, and is normally provided for all such work performed during a given period of time (month, quarter, or fiscal year) up to specified dollar amount. In either case, the liability of the customer is

limited to the amount stated on the order or request. Any additional cost is borne by the customer only through amended orders; otherwise it is covered by the NIF activity [2;12-14].

One of the most important recent developments in NIF management is rate stabilization. Under this concept, the rates charged by NIF activities are established a year or more ahead of the effective date and these rates are expected to remain stable during the entire fiscal year to which they apply. Each year, the rates charged by an activity are adjusted for prior year gains or losses, both at the local activity level and for the activity group (all shipyards for example) as a whole [5;2].

The major objective of stabilized rates is to allow for better achievement of planned programs. Past NIF rate increases within a year caused customers to cut back programs to stay within funding targets. This, in turn, created imbalances in NIF workload, the costs of which were also eventually passed on to the customer. The rationale for rate stabilization suggests that if price fluctuations are inevitable, it is more optimal over time for the NIF activity, or group of activities, to make adjustments than to involve numerous customer commands and their major claimants (superiors in the customers' chains of command from whom they receive their funding) [2;28-30].

C. NAVY INDUSTRIAL FUND ORGANIZATIONAL RELATIONSHIPS

The overall policy guidance for NIF financial management and the stewardship task of ensuring that the fund corpus is

not over-obligated, are responsibilities of the Comptroller of the Navy (NAVCOMPT). NAVCOMPT is required to furnish periodic consolidated financial statements and reports to DOD and the Office of Management and Budget (OMB) showing the status and financial position of the NIF. The information used in preparing these reports is accumulated from the various NIF activities. Thus, while accounting systems used by NIF activities are specifically designed for a particular activity, or type of activity, there is a need for a degree of uniformity across activities to facilitate this reporting. This uniformity is designed to be achieved through the use, by all NIF activities, of the same set of General Ledger Accounts and financial management policies as defined in NAVCOMPT Manual, Volume III, Chapter Eight. NAVCOMPT publishes a handbook for each of the several types of NIF activities which outlines detailed procedures to be used in accounting for NIF funds. These handbooks prescribe the use of cost and expense accounts subsidiary to the general ledger to provide for the unique requirements of a particular type of NIF activity [6;3].

While NIF activities receive fiscal policy from NAVCOMPT, they fall under the administrative chain of command headed by the Chief of Naval Material (CNM). CNM's various systems commands (NAVSEA, NAVAIR, NAVSUP, NAVFAC) are the direct superiors and major claimants in the chain of command for most NIF activities. This major claimant for each type of NIF activity has within its command a Financial Central Design

Agency (CDA). The CDA receives policy guidance from NAVCOMPT and tasking from the major claimant and performs detailed system design, development, and implementation functions for financial accounting systems. In addition, it has responsibility for providing all functional changes, modifications, and maintenance necessary for a financial accounting system, including Automated Data Processing (ADP) changes [6; Appendix C].

There are currently 50 NIF activities performing accounting functions. 43 of these activities are supported by five CDAs. The remaining activities act as their own CDA and perform financial systems development locally. These activity/CDA financial accounting systems relationships are illustrated in Table I on page 20. All the main CDAs, except the Computer Application Support and Development Office (CASDO), perform all necessary analysis and programming for the design, development, and maintenance of the financial system. CASDO, the CDA for shipyards, provides only administrative and management support, policy guidance, and tasking. Actual analysis and programming work is spread among the eight shipyards. The Military Sealift Command and the Navy Publication and Printing Service each consist of several activities and offices. In both cases, however, each group is considered to be, and operates as, one NIF activity for financial purposes [6;3-4].

TABLE I

NIF ACTIVITY CDA RELATIONSHIPS

NIF ACTIVITY TYPE	TOTAL NO. ACTIVITIES	MAJOR CLAIMANT	MAIN CDA	NO. UNDER STD SYSTEM MAIN CDA	NO. UNDER UNIQUE SYSTEMS LOCAL CDA
SHYD	8	NAVSEA	CASDO	8	-
NARF	6	NAVAIR	MSDD	6	-
ORDFAC	10	NAVSEA	CENO	8	2
PWC	8	NAVFAC	FAC 151	8	-
RDT&E	13	CNM/ONR	NAVSUP	13**	-
NPPS	1	NAVSUP	LOCAL	-	1
POLMISSLEFAC	2	SSPO	LOCAL	-	2
MILSEALIFT	1	MILSEALIFTCOM	LOCAL	-	1
AVIONICS CTR	1	NAVAIR	LOCAL	-	1
	50		5	43	7

** STD ACCOUNTING SYSTEM DESIGN IN PROGRESS BY NAVSUP (see page 26)

D. IMPLICATIONS OF THE ORGANIZATION RELATIONSHIPS

It is important to note that the dual lines of responsibility--one for financial management and the other for command--has had major implications for the development and maintenance of NIF accounting systems. Of major significance is that the NAVCOMPT oriented accounting system is generally only part of the command, or activity group, management information system (MIS), but the same CDA handles the design and implementation of both the financial subsystem and the total MIS. For example, FAC 151, the CDA that supports the eight Public Works Centers (PWCs), has developed the Public Works Center Management System (PWCMS) as a highly integrated MIS for use by all PWCs. The financial subsystem is a key element of the overall MIS [7;1]. A similar situation exists for most of the NIF activity groups. This dual role played by the CDA for each NIF activity, over time, produced the situation of interest to this study.

The evolution of a unique accounting system for each NIF activity group, as part of its overall MIS, occurred in part because the various NIF activity groups fall under different subordinate systems commands of CNM, and also because NAVCOMPT had tailored a different handbook of detailed accounting procedures for each NIF activity group. Thus, as each NIF activity group automated its accounting system, the CDA proceeded according to its handbook of unique procedures. Then, as other system components were developed locally, or at the CDA, a command-oriented MIS evolved. In its study, "Duplication

in the Navy's Management Information Systems Is Costly", the General Accounting Office (GAO) quoted an unidentified Navy official as saying that if only one handbook had been available, the Navy would probably have developed only one automated NIF accounting system [8;11].

The development of these unique accounting and management systems at commands within the various NIF activity groups has spanned two decades. The technological improvements in data processing in recent years, and the continuing external pressure to reduce management systems support costs has led to a growing perception that the development and maintenance of individual ADP applications by similar activities is not cost effective. This view has generated a great deal of interest in the consolidation of CDA responsibilities, and the development of a uniform automated system for NIF accounting. This interest, evidenced by a number of studies, is explored in the next chapter.

III. REVIEW OF PREVIOUS STUDY EFFORTS

Interest in the consolidation of CDA efforts in general, and in the NIF activity arena specifically, exists in a number of quarters. This chapter overviews three reports of studies concerning the NIF community; a General Accounting Office (GAO) study, a NAVCOMPT study of Research, Development, Test and Evaluation (RDT&E) NIF activities, and a NAVSUP CDA study. Reactions to the NAVSUP Study in particular are addressed, and some conclusions are drawn as to the appropriateness of the recommendations of the reports reviewed.

A. THE GENERAL ACCOUNTING OFFICE STUDY

One of the leading proponents of consolidation has been the General Accounting Office (GAO). In the report of its study, "Duplication In the Navy's Management Information Systems Is Costly", GAO criticized the Navy for having too many similar, automated information systems, and cited NIF accounting systems as a prime example. The study examined the system documentation for five of the 23 computerized NIF accounting systems. Four of the five were part of a standard MIS used by all activities within a NIF activity group, and the fifth was locally designed and maintained at a Navy laboratory. These five systems were used at 33 of the 50 NIF activities, and each fell under the cognizance of a different CDA. The study concluded that "Although the services the NIF activities provide are extremely diverse, the objectives

of the cost accounting systems are the same--to record material, labor, and overhead costs against customer work orders" [8;9]. The report noted that while the details of the systems varied, they all used similar logic and procedures to allow for the control of work orders, the charging of costs to work orders, editing and validation of accounting transactions, and customer billing. All the systems maintained summary data files and rendered management reports that contained similar information.

The example of NIF accounting systems, was only one of several offered in the GAO study to support the contention that unnecessary duplication exists. The report concluded that the Navy does not need a separate MIS for each of its major commands or activity groups. In GAO's view, effective use of ADP as a management tool does not depend on organizational structures or command lines. The differences that exist in the present command MISs have occurred because the systems evolved over a 15 to 20 year period to the point where they support every function performed by the activities that use them. This independent development of systems, without considering the information requriements on a Navy-wide, functional basis has resulted in the acquisition of computer hardware used exclusively in support of a single system. This makes it difficult to exchange data, equipment, or the expertise of programmers and analysts, between commands and systems [8;i-ii]. The report also noted that the CDAs, which are

responsible for maintaining the various MISs, lack an adequate number of programmers and analysts. Huge backlogs exist in requests for system improvements, and when changes in functional procedures are mandated, these scarce personnel must implement the changes in each automated system. The study concluded that the Navy must resolve

> ... a central, issue that has plagued the data processing program since its inception; that is, whether data processing resources should be organized to support separate commands or functional programs. The Secretary of the Navy should conduct a system-by-system analysis to identify, on a Navy-wide basis, the common management functions supported by the Navy's many information systems. This analysis should be used to develop a long-range plan for organizing and using technical resources along functional, rather than command lines. [8;ii-iii]

B. THE RESEARCH, DEVELOPMENT, TEST, AND EVALUATION STUDY

On 7 October 1977, the Under Secretary of the Navy requested that a study be conducted to determine the feasibility of a single CDA for developing and implementing a uniform, automated NIF accounting system for the thirteen Research, Development, Test, and Evaluation (RDT&E) NIF activities. These NIF activities were, at the time of the study, operating under thirteen locally designed and maintained accounting systems. The Under Secretary suggested that economies of scale might be realized with a single accounting system developed and maintained by a single CDA [8;12].

A Steering Committee and a Working Group were formed to conduct the study under the auspices of the Deputy Assistant Comptroller of the Navy (Financial Management Systems).

The study was conducted, and in a report issued 24 July 1978, the Working Group concluded that it was feasible for a single CDA to design and maintain a single NIF accounting system for use by the thirteen RDT&E laboratories. The report indicated that an annual savings of $5.3 million could be realized by the laboratories after a startup cost of $2.4 million [9;1-5]. Following the recommendation of the Steering Committee, the Chief of Naval Operations (CNO), on 8 September 1978, assigned CDA responsibilities to NAVSUP and directed that a uniform NIF accounting system be designed and installed at RDT&E activities [10;1].

A CDA Project Officer was designated at NAVSUP and RDT&E financial systems personnel were assigned to the CDA team. This team has prepared a concept paper, held discussions with various contractors for hardware and software selection, prepared a system Functional Description and an Automated Data System plan. The team is presently preparing system specifications and it is anticipated that the uniform RDT&E NIF Accounting System will be ready for testing in October of 1980 [6;5].

C. THE NAVAL SUPPLY SYSTEMS COMMAND STUDY

On 29 January 1977, the Chief of Naval Material (CNM) issued a notice that identified the need for consolidation of the Navy Material Command (NMC) CDA functions and chartered a Steering Group to develop a plan for the realignment. Adopting one of the recommendations of the Realignment Report,

CNM, on 29 March 1977, transferred the CDA responsibilities of the Navy Material Command Support Activity to NAVSUP. On 22 February 1977, the Deputy Comptroller of the Navy recommended that the realignment study include the possibility of consolidating the CDA responsibilities in support of NIF activities. Citing these actions and recommendations, CNM, on 29 August 1978, tasked NAVSUP to "...conduct a survey of NMC financial CDA functions in support of NIF activities to determine the degree to which it is feasible and desirable to consolidate financial CDA functions" (emphasis added) [11;1]. On 10 July 1979, NAVSUP issued a draft report entitled "Study for Standardization and Consolidation of Navy Industrial Fund Central Design Agency Functions" (Appendix).

In its statement of objective, the report noted that "The purpose of the Navy Industrial Fund (NIF) financial management study is to determine the feasibility of consolidating the NIF financial systems development activities into one financial Central Design Agency under one managing headquarters organization" [6;1]. The study included within its scope all NIF CDAs, as well as those NIF activities which perform CDA functions locally [Table I, Chapter I]. All financial management areas were to be analyzed by the working group to determine the feasibility of a single CDA for financial management. The three phase methodology included: (1) the study of documentation pertaining to the accounting systems in operation, the ADP resources utilized, and the CDAs role at each activity; (2) on-site visits to representative

NIF activities to obtain a general overview of the accounting systems in place; and (3) a financial management questionnaire designed to fully describe all CDA financial functions, and to assemble data for a quantitative analysis [6;5-6].

In its Discussion and Analysis section (Appendix; pp. 58-60), the report noted the GAO criticism of the numerous NIF CDAs and accounting systems. It observed that all CDAs service the same functional financial management areas and must go through the same processes for systems design and maintenance. Like GAO, it concluded that the present multiple CDA structure has resulted in wasteful and redundant systems design efforts, that savings through economies of scale would be realized in a single CDA environment, and that a single NIF CDA could and should work toward the design of a single, uniform, automated NIF accounting system.

The report presented three alternatives which the study group felt were most viable and consistent with their objective in the study. The first was to maintain the status quo and retain the multiple CDA systems management structure. The second alternative was to establish a CDA management office to work with the existing CDAs and coordinate the design and maintenance of the NIF financial management systems in place. The third alternative was to establish a single CDA to be responsible for the design, development, and maintenance of all existing and future financial management systems within the NIF community. The report stated that other

options were considered but they were not presented. Also omitted was the judgement criteria under which these alternatives were chosen and the other options discarded. The report presented an array of some conditions that the study group perceived to be advantages and disadvantages inherent in each of the considered alternatives [Appendix; 64-66].

In its conclusion, the report recommended alternative three, a single CDA for NIF financial applications, judging it to be "...the most cost effective alternative because it will encompass a reduction in CDA operating costs in addition to lower administrative/management costs" (emphasis added) [6; 15]. However, no evidence of such cost reductions is offered, and the report immediately qualifies its recommendation "...because there is not a valid cost-benefit analysis which will support the recommendation. An economic analysis has not been performed because it became obvious to the study group that portions of the information obtained from both primary and secondary sources appear to be ambiguous and inconclusive" (emphasis added) [6;15]. The report's final recommendation was that an independent agent be commissioned to perform an in-depth study, to include an economic analysis, of the issues and resources associated with consolidation/ standardization of the NIF financial CDA functions.

D. REACTIONS TO THE NAVSUP STUDY

The NAVSUP Study draft report was sent, on 10 July 1979, to NAVSEA, NAVAIR, and NAVFAC as the major claimants, under

CNM, of the four major CDAs that had been asked to respond to the questionnaire mailed out in the course of the study. Their responses to the draft report of the study, all unfavorable, provide some insight into the weaknesses of the NAVSUP study, and the multi-level consideration that must be given to this complex issue. A good summary of the position of all three can be found in NAVSEA's statement that "...the study does not afford sufficient economic, logistic, or functional basis to prove that standardization/consolidation (of NIF financial systems or CDA functions) is either feasible or desirable" (emphasis added) [12;1]. Some specific criticisms of the NAVSUP study are:

1. Some question exists as to whether the NAVSUP study exceeded the scope and authority of its charter from CNM in the tasking letter, which asked NAVSUP to "...determine the degree to which it is feasible and desirable to consolidate financial CDA functions." NAVSEA felt that the objective of the study, as indicated in its first paragraph, "...to determine the feasibility of consolidating the NIF financial systems development activities into one Financial Central Design Agency...," represented a vast expansion of this scope and authority. They offered that "A clear distinction exists and must be drawn between financial/accounting systems design and development functions and financial CDA functions. Design and development of financial/accounting policies, procedures, and systems are not CDA functions. As per the

study's own definition, financial CDA functions relate to ADP design, development, and implementation functions for financial accounting systems" [12;enclosure 1, p. 1]. Thus, it appears that multiple objectives and interpretations exist, with the implication for CNM to clarify both its intentions and, perhaps, indicate its preference for the relative importance of these objectives.

2. The report fails to discuss many problems that would be faced in implementing the recommended CDA consolidation. Such a CDA would have to deal with a variety of ADP equipment configurations or try to standardize equipment. Costs would be substantial in either case. The requirement would exist to provide for varying data collection and input processing systems. There is a lack of standard accounting procedures among the NIF activity groups. NAVCOMPT maintains separate NIF accounting handbooks for each. The requirement exists to interface the financial systems with the variety of existing highly integrated MISs that support the various NIF activity groups.

3. If the ultimate result envisioned by the study group is, as it appears from the report, to have a single CDA and a single uniform NIF accounting system, the report does not address many of the implications of such a move. The costs to develop a NIF-wide standard system and the dual system costs during implementation are not addressed. The problem

and cost of integrating the NIF financial system into the MIS supporting other command functions at the various activities is not mentioned. Other big problems would be the difficulty in providing responsive customer service and in making timely changes in a much larger, highly integrated financial system. Again, the implication is that multiple conflicting objectives need to be clearly addressed by the decisionmaker.

4. The NAVSUP report draws conclusions similar to the GAO study's contention that the multiple CDA structure and several NIF accounting systems were redundant. In defending the continued maintenance of separate CDAs and accounting systems for the two NIF activity groups under its jurisdiction (shipyards and ordnance facilities), NAVSEA quoted several paragraphs from CNM letter 09/542 of 7 June 1979, which took a strong position against the draft report of the GAO Study previously discussed. NAVSEA felt that several of CNM's statements against the GAO Study are also valid criticisms of the NAVSUP Study.

> The GAO assumes that all generic functions can and should be standardized and examines NIF accounting systems...contrary to the GAO position, it is not true that the tasks accomplished on a day-to-day basis to account for financial operations are the same. It appears little analysis was done of the actual day-to-day functional processes across different commands. Exception is taken to the GAO statement that information required to manage any function common to more than one type of field activity should be defined on a Department-wide basis. The Navy simply does not manage that way. If the Navy were organized on a functional basis instead of a

> command basis, the local commander could be replaced by a coordinator since functional czars would have cognizance over their areas of expertise. Sight has been lost of the fact that the activity commander has the responsibility for mission accomplishment. [12; enclosure 1, p. 3-4]

5. The study merely points out the opportunity for consolidation of CDA functions and standardization of NIF accounting systems. It offers little evidence of feasibility or desirability, perhaps since the import of both terms is unclear in the guidance provided by CNM. Finally, no evidence is cited to suggest that the recommended consolidations would be any more cost-effective.

E. CONCLUSIONS

The NAVSUP draft report itself, as well as all the systems commands that reviewed it, recognized that the study did not contain a cost-benefit analysis to support its recommendation, and that a more in-depth study which included such an analysis was required. Reactions to both the GAO and NAVSUP studies indicated conflict over:

1. multiple and conflicting objectives. The question is which alternative course of action is most desirable, and according to which objective of which decisionmaker.

2. whether a cost-benefit analysis of this issue is possible. There have been repeated calls for such an analysis, and yet none has been successfully performed.

3. the assumptions driving the studies conducted. One is that the functional standardization is superior to a command oriented approach. Two related, inherent assumptions are that the existing local efforts are uneconomical, and that these local efforts are similar enough in nature to argue that consolidation will result in economies of scale. The RDT&E accounting consolidation currently in process may provide evidence to support or rebut these assumptions, but even if support emerges, it is uncertain whether the RDT&E study conclusions are generalizable to other NIF activity groups.

Chapter IV provides a rationale to suggest why cost-benefit analysis may not be appropriate to deal with the NIF CDA issue. An alternative methodology is proposed that is: (1) useful in assessing policy issues characterized by multiple and conflicting objectives that are not readily quantifiable and/or measurable, and (2) particularly amenable to addressing issues such as feasibility and desirability, to aid the decisionmaker's judgement.

IV. A METHODOLOGY FOR ANALYSIS OF NIF CDA ALTERNATIVES

Simply stated, a cost-benefit analysis is a comparison of both the cost of a proposed solution to a problem and the economic benefits which would result from that solution. The problem associated with applying such an approach to policy issues is discussed by Quade who argues:

> ...the decision maker must judge whether a given undertaking is worth the cost. When this has to be done, the most common approach is to express the benefits and costs associated with each alternative in dollars as a function of time, discount the future benefits and costs at some appropriate rate, and then compare the alternatives on the basis of the present value of net benefits. This is the classical Cost-Benefit Analysis approach--something that is hard to execute well in analyzing today's complex policy issues. A fundamental difficulty is that in many public projects it is hard to classify every impact as either a cost or a benefit let alone find an acceptable way to express (them) in dollars....(emphasis added) [13;59]

As noted earlier, both the NAVSUP Study and the major claimants who responded to it recommended a cost-benefit analysis to aid in deciding among the alternatives for a NIF CDA organization. Given the inherent difficulty in conducting a meaningful cost-benefit analysis in a policy arena as suggested by Quade, this chapter discusses the appropriateness of such an approach to the NIF CDA issue in light of three major concerns: (1) expected economies of scale, (2) distributional effects, and (3) the objectives of the proposed policy alternatives. A description of an alternative approach

known as scorecarding then follows with a pro forma illustration of its applicability to the NIF CDA issue.

A. ECONOMIES OF SCALE

One of the major reasons cited in favor of consolidating NIF CDA functions in all of the studies discussed earlier, is the expectation of significant economies of scale. The perception appears to be that one CDA can consolidate the resources of several smaller CDAs, and perform the totality of the functions at a major reduction in personnel and overhead costs. Thus, in theory, a major economic benefit would accrue. It is important to note, however, that economies of scale will only accrue to a consolidated CDA to the extent that it can provide an output of CDA functions and service that is greater than or equal to the sum of the individual outputs of the smaller CDAs now in existence. Inherent in the economy of scale argument is the assumption that not only is the output of the smaller CDAs similar enough to be additive, but also that it is measurable. If not, the economies of scale argument does not fare well in addressing the NIF CDA issue.

It is doubtful that a simple consolidation of NIF CDAs could be accomplished to generate the expected economic benefits. Recall that each CDA is responsible (at present) for the entire MIS of a NIF activity group, including the NIF accounting system. Thus, unless a significant reorientation of Navy information and control systems, as advocated by GAO,

occurs, the existing CDAs would probably still be required for non-NIF accounting, information system requirements.

Beyond this expectation of economies of scale, the studies have suggested no other direct economic benefits that might accrue from consolidation. The lack of tangible benefits to be considered as part of cost-benefit analysis suggests that perhaps the keystone of the argument for consolidation is gone. The fact that many of the costs and benefits are intangible means that the cost-benefit approach may not be applicable. For example, the NAVSUP report cites five possible advantages of a single, consolidated CDA [Appendix , p. 66]. Examining these reasons suggests that it may be rather difficult to determine dollar values for "satisfied GAO requirements", "centralized policy guidance and interpretation", or "an established base of knowledge for future standardization efforts." But, as noted above, cost-benefit analysis requires dollar estimates.

B. DISTRIBUTIONAL EFFECTS

A significant aspect of the NIF CDA issue is the potential impact of various alternatives on various levels of command. As Quade notes, "There are also other dimensions of interest to the decisionmakers--for example, the costs may be paid and the benefits received by different sets of people. There is no foolproof way to bring these distributional impacts into the cost-benefit format" (emphasis added) [13;59]. The NAVSUP report states that "It is anticipated that resultant

benefits in savings (from CDA consolidation) will accrue to the Navy Material Command. Additionally, it is expected that corollary tangible and intangible savings exist in the support activities" [Appendix; p. 60].

Thus, if the economies of scale were to eventuate, the distributional impact would likely be rather negative for the systems commands or NIF activity groups, in that few tangible benefits would accompany significant budget cuts and reduced personnel ceiling points. Further, local CDA personnel may be transferred or otherwise lost, while at the same time, significant MIS redesign, hardware/software acquisition, and associated training may be necessary. Finally, increased customer response time may be a result. All of these changes, even if measurable in dollar terms, may prove difficult, if not impossible, to deal with in a cost-benefit analysis.

C. OBJECTIVES

Considerable evidence exists in the studies examined in Chapter Three to suggest that there exist multiple and competing objectives concerning the NIF CDA consolidation issue. Further, the clarity of the objectives varies significantly. Of major concern are CNM's objectives as expressed in the tasking letter for the NAVSUP Study. Recall that CNM tasked NAVSUP to determine the degree to which it is <u>feasible</u> and <u>desirable</u> to consolidate CDA functions. There are significant questions as to the nature of CNM's objectives and the meaning

of these two terms. Does feasible mean technically, economically, or politically feasible? What characteristics make a consolidated CDA or NIF accounting system desirable? Does CNM want a single, uniform accounting system or merely comparable output from the existing multiple systems? It remains for CNM to make clear its objectives. By its actions, it appears that CNM has taken the position that if significant economies of scale may be realized, consolidation is worth studying. Apparently, CNM's objective is to consolidate <u>if and only if</u> the same, or better, service results at a lower cost.

The objection raised by NAVSEA to the NAVSUP study group's interpretation of CNM's objective indicates the nature and magnitude of the problems associated with multiple and possibly conflicting objectives. For any issue, different analysis and decisionmakers will often take different, and sometimes opposing positions. These differing opinions will quite naturally reflect differing perceptions and objectives regarding the issues under consideration. In the NIF CDA issue, GAO has apparently perceived that costly duplication exists and that <u>functional</u> reorganization of NIF CDA/accounting functions is therefore required. NAVCOMPT, by the issuance and continued maintenance of separate NIF accounting handbooks, lends credence to a view that sufficient procedural differences exist to warrant, to some degree at least, local (and perhaps separate) CDAs and accounting systems. NAVSEA, and the other reviewers of the NAVSUP Study, have also embraced this position. These

major claimants of the NIF activities and activity groups view the CDAs as providing entire MISs in which the NIF accounting system is a key element.

Given these multiple and conflicting objectives the cost-benefit approach may be difficult to apply. As Quade notes, "Major decisions in the field of government policy are part of a political as well as an intellectual process. To achieve an acceptable solution, considerations other than those of direct cost and effectiveness are important: morale, tradition, political acceptability, organizational behavior" [13;60-61]. Further he argues, if cost-benefit analysis is to aid the decisionmaker, the analyst must determine what the decisionmaker wants to achieve. "With multiple objectives, this may require determining how much of each [the decisionmaker] is willing to give up in order to obtain more of another" [13;84].

D. AN ALTERNATIVE METHODOLOGY

The above discussion strongly suggests that a cost-benefit analysis methodology may not be appropriate for addressing the NIF CDA consolidation issue. Not only does each of the concerns noted above individually cast doubt on the efficacy of such an approach, but the interaction of multiple and conflicting objectives with incomplete knowledge whether economies of scale would result from consolidation produce a situation that is incompatible with the assumptions underlying the cost-benefit technique. Only when there is a clear

understanding of the objectives, and reasonable certainty as to the economies of scale that will accrue, can one expect to gain the desired insight through a cost-benefit approach. Because of this interaction, even if the objectives are well understood, cost-benefit analysis is still inappropriate if the economies of scale benefit is uncertain. One can only conduct an empirical test of the alternatives to see if the desired outcome is achieved. As an example, the RDT&E CDA and accounting system consolidation in progress can be considered, and explored, as such a test. This interaction is more fully explored in Thompson's book, Organizations in Action [14;84-87].

For all the reasons that have been discussed above, it is clear that the cost-benefit analysis called for by the study groups and reviewers is not appropriate, and it may not be possible for an analyst to prepare an unambiguous ranking of alternatives. A technique known as scorecarding is a possible methodology to deal with determining whether such a desired state of affairs can be achieved in assessing policy alternatives. Scorecarding is a scheme that may be used to list the characteristics and impacts of the various alternatives, and leave the task of integrating the impacts and ranking the alternatives to the judgement of the decision-maker.

Scorecarding is not new, having been developed and successfully used in a number of studies of transportation service alternatives by Bruce Goeller of the Rand Corporation. A

scorecard is simply a matrix in which the alternatives being considered are listed on one axis and the impacts on the other. In this approach, the impacts, or consequences that are likely to result from the decision to select one of the alternatives are displayed in terms of physical units or terminology commonly used to characterize them rather than being converted to a scale such as dollars. Impacts include costs, benefits, spillovers, risks, and segments of the population affected. An ideal scorecard presents the full spectrum of impacts, both good and bad, with an indication of who pays the costs and who gets the benefits [13;100-101].

A sample of the use of a scorecard by Goeller to evaluate some possible future transportation systems is provided in Table II on page 43 [13;60]. The proposed systems must provide passenger service along two heavily travelled routes between two large cities about 500 miles apart. The decision-makers are interested in determining how to allocate research and development resources, and what the environmental trade-offs might be, for a preferred mix of transportation systems to be operational in 10 to 15 years. In advocating the use of scorecarding for policy decisions, Quade states:

> ...objectives are seldom, in fact, agreed upon and this disagreement may not be uncovered by the analyst, no matter how hard he tries, until the decisionmakers are presented with the consequences that are likely to occur--a look at the scorecard, for instance--and they realize the full implications of what the analysis assumed to be wanted. The choice, although ostensibly between alternatives, now may turn out to be really between objectives. (Emphasis added) [13;61]

TABLE II

SAMPLE SCORECARD

IMPACTS	Base (CTOL) Case	VTOL Case	TACV Case
TRANSPORTATION SERVICE IMPACTS			
Passengers (millions yearly)	7	4	9
Door-to-door trip time (avg.)	2 hr	1.5 hr	2.5 hr
Door-to-door trip cost (avg.)	$17	$28	$20
Airport congestion (% reduction)	0%	5%	10%
FINANCIAL IMPACTS			
Investment costs ($ millions)	150	200	2000
Net annual subsidy ($ millions)	0	0	90
ECONOMIC IMPACTS (peak year)			
Added jobs (thousands)	20	25	100
Added sales ($ millions)	50	88	500
COMMUNITY IMPACTS			
Noise (thousand households)	10	1	20
Air pollution (% all emissions)	3%	9%	1%
Petroleum savings	0%	-20%	30%
Households displaced	0	20	500
Land taken (acres)	0	25	8000
Taxes lost ($ millions)	0	0.2	2.0
Landmarks destroyed	none	none	Fort X
DISTRIBUTIONAL IMPACTS			
% low income trips taken on this mode	7%	1%	20%
% of noise-impacted households who are low income	2%	16%	40%

Abbreviations: CTOL = conventional takeoff and landing aircraft
VTOL = vertical takeoff and landing aircraft
TACV = tracked air-cushion vehicle

Source: [13;60]

Table III, on page 45, presents a "pro forma" scorecard of some potential impacts of the NAVSUP Study alternatives for NIF CDA consolidation. The applicability of the scorecard approach is illustrated by the array of the three alternatives and the impacts of each, including many of the advantages and disadvantages listed in NAVSUP's analysis. The body of the scorecard indicates some possible effects of each alternative in each of the impact areas. The purpose, in this case, is to suggest and illustrate the scorecard technique. While no analysis was conducted to confirm the effects listed, this does not mean that the quantitative aspects can not be considered. However, the temptation to apply the cost-benefit approach must be avoided because neither the costs, nor the benefits, if quantified, are necessarily additive.

This side-by-side comparison allows the analyst to present study results in such a way that the decisionmaker can select the pattern of impacts preferred. As one might expect, no one alternative is dominant. For example, additional costs of an alternative may lead to more benefits. Additionally, alternatives and variations can be readily introduced and further analysis conducted. In this way, the alternatives can be "fine-tuned" to correspond with the objectives, perhaps also "fine-tuned", of the decisionmaker.

TABLE III

PRO FORMA SCORECARD FOR NIF CDA ALTERNATIVES

IMPACTS	Alternative #1 Current Multiple CDAs	Alternative #2 CDA Management Office	Alternative #3 Single NIF CDA
POLICY IMPACTS			
GAO policy	contrary	contrary	approaches
NAVCOMPT policy	satisfies	satisfies	may satisfy
SYSCOM/User viewpoint	satisfies	some objections	contrary
System standardization	no change	no change	no initial change
Centralized policy guidance	NAVCOMPT	CDA mgt office	single CDA
FINANCIAL IMPACTS			
Additional reprogramming costs	none	minor	very high
Equipment replacement costs	none	none	high
Personnel costs	no change	slight increase	slight decrease
Overhead/support costs	no change	slight increase	may decrease
NIF SYSTEM SERVICE IMPACTS			
Affect on existing MISs	no change	no change	reprogram
Financial system coordination	no change	enhanced	much better
Affect on local operating procedures	none	few	many
Ease of system changes	no change	more difficult	much harder
Response time to customer requests	no change	slower	much slower
Time to accomplish system changes	no change	slower	much slower
COMMAND IMPACTS			
Organizational relationships	no change	extra mgt layer	one remote CDA
Customer contact point relationships	no change	no change	disrupted
Affect on the number of CDAs	none	+ 1	- 6
Affect on size of overall CDA function	none	slight increase	minimal decrease
DISTRIBUTIONAL IMPACTS			
Funding requirements imposed on	SYSCOMs	SYSCOMs/CNM	CNM
Accrual of cost savings to	N/A	SYSCOMs/CNM	CNM
Spillover costs of service reductions	N/A	SYSCOMs	SYSCOMs

E. BENEFITS OF THE SCORECARD APPROACH

Use of the scorecard technique provides several benefits. The analyst and decisionmaker are freed from the assumptions inherent in the use of cost-benefit analysis. The approach can deal with the possibility that economies of scale may not accrue, that many costs and benefits may prove to be intangible, and system outputs may not be additive. Multiple and conflicting objectives can be dealt with in the array of impacts rather than assuming, as does cost-benefit analysis, that the objective is given and can be unambiguously met by an alternative. The scorecard process is iterative. The decisionmakers, as well as others affected by the decisions, can interact with the analyst and the alternatives can be refined as desired. Scorecarding is geared to the appropriate decisionmaking level, yet it still allows for explicit analysis of the alternatives and their impacts. Quade notes that:

> A scorecard is not only an acceptable method of handling the criterion problem when no clear dominant single measure can be agreed upon, but it is also a way to protect against or counter the biases of the analyst...decisionmakers can reshuffle the analyst's arrangement and they can call for various sensitivity tests to be run to determine how changes in assumptions originally made by the analyst affect the results. A scorecard presentation is also something the public can understand. They, like the decisionmakers, can ask "what if" questions of the analysts, which, when answered will show not merely the changes in ranking the alternatives but also the impacts. [13;101]

A major disadvantage with scorecarding is that analysts and decisionmakers are conditioned to look for precise, quantifiable terms in an analysis, and both may have an

uneasy feeling that there may be a better way. With the CDA consolidation issue, the reality is that the decision is a very tough one, and the answer cannot be bought easily with the cost-benefit approach.

V. CONCLUSIONS

This study concerned alternative methodologies to address the feasibility and desirability of NIF CDA consolidation. To clarify the issue and to illustrate the strong and varied interest in it, the key features of NIF accounting, NIF CDA organizational relationships, and some implications were discussed. A review of recent studies concerning the consolidation issue, as well as the reaction of the affected systems commands to a draft report of the study by NAVSUP, were presented. These studies and the commands that reviewed them uniformly called for a cost-benefit analysis of the alternatives for NIF CDA consolidation.

The major conclusion reported by this study is that the cost-benefit approach may not be an appropriate methodology for the analysis of the feasibility and desirability of the NIF CDA consolidation. The assumptions underlying this technique become extremely tenuous in addressing policy issues. Further, cost-benefit analysis breaks down when dealing with multiple and conflicting objectives and intangible benefits. Instead, the alternative methodology of scorecarding is proposed for analysis of the NIF CDA consolidation issue.

This study concluded that scorecarding is more appropriate to the consolidation issue in that the restrictive assumptions of cost-benefit analysis are relaxed, and the impacts of the alternatives and the multiple objectives are

displayed side-by-side for consideration by the decision-maker. Not only does scorecarding allow for "fine-tuning" of the objectives by the decisionmaker, but also once the objectives are clear, iterative analyses can be conducted to "fine-tune" the alternatives.

It is important to note that this study concludes that whether consolidation of NIF CDAs is feasible or desirable depends for the most part on the objectives of the decision-maker, and the costs he is willing to incur in reaching those objectives. The array of the impacts and the effects of the various alternatives in the scorecard can help him rank his objectives according to their relative importance in light of the consequences of his options. A useful extension of this study's conclusion that warrants further exploration is a technique to rank or assess the relative merits, or preference order, among competing objectives. Multiattribute Utility Measurement is such a technique which can be useful in policy making situations that involve the values and goals of the decisionmaker [15;326-340]. Because clear objectives are so important in choosing an alternative, such a technique might be used in conjunction with a scorecard to help clarify the objectives in the CDA consolidation issue.

It should not be inferred from this study that the cost-benefit approach might not be appropriate to deal with selected aspects of potential impacts stemming from the consolidation alternatives. Many effects of the alternatives listed in the body of the scorecard will probably be such that clear

objectives and measurable outputs render cost-benefit analysis appropriate and useful at this level of the CDA consolidation issue. Indeed, such analyses, where appropriate, can assist the decisionmaker and the analyst in their attempt to sort out the objectives and "fine-tune" the alternatives within the scorecard framework.

While this study has recommended scorecarding as the preferred methodology to address the NIF CDA issue, it is recognized that it may encounter difficulty in gaining acceptance and use. Although the use of the cost-benefit approach may appear to be more comfortable, advocates of this approach to the NIF CDA consolidation issue at least should now be more aware of its potential dangers.

APPENDIX

STUDY FOR STANDARDIZATION AND CONSOLIDATION

OF

NAVY INDUSTRIAL FUND CENTRAL DESIGN AGENCY FUNCTIONS

PREPARED FOR

CHIEF, NAVAL MATERIAL COMMAND

PREPARED BY

NAVAL SUPPLY SYSTEMS COMMAND

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I. OBJECTIVE

This study was prepared by the Naval Supply Systems Command in accordance with instructions received from the Chief of Naval Material (CNM). The purpose of the Navy Industrial Fund (NIF) financial management study is to determine the feasibility of consolidating the NIF financial systems development activities into one financial Central Design Agency under one managing headquarters organization.

II. BACKGROUND

One of the principal recommendations of the Hoover Commission provided that certain business or commercial-type activities be established within the military services and financed by means of revolving or working capital funds. This recommendation was later enacted into law in 1949 as part of the National Security Act. Accordingly, the Department of Defense (DOD), as a result of this law, issued to the DOD components (i.e. Army, Air Force, Navy and Marine Corps) DOD Directive 7410.4 entitled "Regulations Governing Industrial Fund Operations" for implementation. Currently, each military service separately manages its activities approved for operations under DOD Directive 7410.4.

The source of working capital is provided by Congress through an industrial fund appropriation which is allocated to each military service. The Navy portion of working capital received from Congress via DOD is identified as the Navy Industrial Fund (NIF) appropriation. The Comptroller of the Navy (NAVCOMPT) allocates the working capital to approved Naval activities operating within the NIF environment.

The Navy Industrial Fund activities currently operate under a commercial type cost accounting system adapted specifically to the activity or to the type of activity. For example, the Navy Printing and Publications Service (NPPS) uses a process job costing system, whereas the Naval Air Rework Facilities (NARFs), the Naval Shipyards (NSYs), Public Work Centers (PWCs), etc., use a job order costing system. All activities are financed under the Navy Industrial Fund and utilize accounting systems which provide for the distribution of all direct, indirect and overhead costs by cost centers in such a manner as to recover all costs of operation through reimbursement from its customers.

Considerable efforts have been expended to consolidate Department of the Navy (DON) financial management functions and to standardize the development and implementation of accounting systems. A Chief of Naval Material (CNM) study in early 1977 resulted in consolidation of the former Naval Material Command Support Activity (NMCSA) Central Design Agency (CDA) financial systems functions with the CDA financial systems functions of the Fleet Material Support Office (FMSO). A follow-on study in the summer of 1977 resulted in the consolidation of financial and accounting functions performed by the Naval Supply Systems Command (NAVSUPSYSCOM), the Navy Regional Finance Center (NRFC), Washington, the Navy Accounting and Finance Center (NAFC), and the Naval District Washington (NDW). Additionally, the responsibility for the Level III Naval Air Stations' accounting, payroll, and inventory systems was transferred to NAVSUP to further strengthen the financial systems development efforts for these activities. In late 1978, NAVSUP was designated as the CDA for the NIF Research, Development, Test and Evaluation (NIFTE) financial systems; however, the remaining

Navy Industrial Fund Systems (NIF) under CNM control were not included in either of these studies. Therefore, the next logical step was the assessment of possible standardization/consolidation opportunities in connection with NIF CDA and accounting functions.

Although the accounting systems used by NIF activities are specifically designed for a particular activity or type of activity, there is a requirement for a degree of uniformity for the preparation of reports for submission to the Secretary of Defense, Office of Management and Budget, Comptroller of the Navy and major claimants. Needed uniformity is ensured through General Ledger Accounts as defined in NAVCOMPT Manual III, Chapter Eight. Handbooks published by the Comptroller of the Navy prescribe the use of cost and expense accounts subsidiary to the general ledger to provide for the unique requirements of a particular commercial-industrial activity or type of activity.

There are currently fifty CONUS and EXCONUS commercial-industrial activities performing their own Authorization Accounting Activity (AAA) functions. Five CDAs support forty-three activities in the design, development, programming and maintenance functions of their financial management systems. The remaining activities perform their own financial systems development functions.

These relationships are illustrated in the following matrix:

CLAIMANT	CDA	ACTIVITY TYPE	NUMBER
CNM	NAVSUP	RESEARCH, DEVELOPMENT, TEST and EVALUATION ACTIVITIES	13
ONR	"		
NAVSEASYSCOM	CASDO	SHIPYARDS	8
	CENO	ORDNANCE ACTIVITIES	8
	LOCAL	" "	1
	LOCAL	SHIP WEAPONS SYSTEMS ENGINEERING STATIONS	1
NAVAIRSYSCOM	MSDD	AIR REWORK FACILITIES	6
	LOCAL	AVIONICS CENTERS	1
NAVFACENGCOM	FAC 151	PUBLIC WORKS CENTERS	7
CINCLANTFLT	FAC 151	" "	1
SSPO	LOCAL	POLARIS MISSILE FACILITIES	2
NAVSUPSYSCOM	LOCAL	PUBLICATIONS and PRINTING SERVICES	1
MILSEALIFTCOM	LOCAL	MILITARY SEALIFT COMMAND ACTIVITIES	1
			50

It should be noted that in the Military Sealift Command all activities are considered as a group and operate as one industrial-commercial activity. The Navy Publications and Printing Service also operates in essentially the same way.

A portion of the CDAs, such as for shipyards, only provide administrative and management support, with the actual analysis and programming being accomplished by the user activities. Other NIF CDAs perform the analysis and programming necessary to accomplish design, development and maintenance support functions.

The CHNAVMAT tasked the Naval Supply Systems Command on 29 August 1978 to conduct a survey of Naval Material Command (NMC) financial Central Design Agency functions in support of NIF activities to determine the degree to which it is feasible and desirable to consolidate financial CDA functions. In order to fulfill the stated objective a study group was established at NAVSUP Headquarters in November, 1978. Members of the study group consisted of representatives from NAVSUP, FMSO, and NAVCOMPT. In a related effort, on October 8, 1978 the Chief of Naval Operations (CNO) designated the Naval Supply Systems Command as the CDA for the thirteen RDT&E NIF activities and requested the design, development, implementation, and maintenance of a uniform NIF financial management automated data processing (ADP) system for these thirteen RDT&E activities. CNM assigned NIF RDT&E systems personnel as members of a CDA team under the direction of a NAVSUP CDA project officer. Development work to replace 13 individual RDT&E NIF financial management/ accounting ADP systems with one standard financial system and provide required interfaces with other ADP programs commenced on 9 January 1979 and is currently in progress. The NIF RDT&E CDA team has provided a concept paper, conferred with various contractors for hardware/software selection, prepared the system functional description (FD), the automated data system (ADS) plan, and is presently preparing system specifications. It is anticipated that this system will be ready for testing in October 1980.

III. METHODOLOGY

The scope of the study included all appropriate NIF Central Design Agencies as well as NIF activities which function as a CDA. All financial management areas were analyzed by the working group to determine the feasibility of a single CDA for financial management. The study was conducted in the following manner:

a) Phase 1 - Obtain and study all available and pertinent documentation pertaining to the accounting systems in operation, the ADP resources utilized, and the CDAs role at each activity;

b) Phase 2 - Conduct on-site visits to representative NIF activities to obtain a general overview of the respective accounting systems and to evaluate the effectiveness of each. In addition, the on-site visits would enable team members to identify the major systems/subsystems in use and the degree of interface with the financial management systems.

c) Phase 3 - Develop and disseminate to all CDAs and activities a financial management questionnaire designed to fully describe all CDA financial functions, and to assemble data necessary for a quantitative analysis.

IV. DISCUSSION & ANALYSIS

The Department of the Navy currently designs, develops and maintains uniform Automated Data Processing (ADP) financial management applications by CDAs for implementation at multiple activities. Due to continuing budgetary pressures the need to reduce ADP support costs and development costs, coupled with current advances in computer software and hardware technology, has rendered the systems development efforts for individual ADP applications by similiar functional activities cost ineffective. In light of these developments the Office of the Secretary of Defense (OSD) has committed itself to achieving a high degree of uniformity among ADP programs and applications. The multiplicity of NIF financial management systems and CDAs has drawn criticisms from various outside agencies, including the General Accounting Office (GAO).

It is apparent that the present multiple CDA structure has resulted in wasteful and redundant system design efforts throughout the NIF financial management community. Some of the contributing factors that lead to these redundancies and inefficiencies include the fact that:

a) Each CDA designs, develops and maintains its own financial management systems.

b) Each CDA is subject to different interpretations of policy promulgated by higher authority to be implemented by the CDA/Activity.

c) Each CDA develops its own software and system documentation.

d) Each CDA employs its own professional ADP staff and support personnel.

e) Each CDA area supports a multitude of hardware configurations.

All CDAs service essentially the same functional financial management system/subsystem areas. This study identifies these systems/subsystems as cost accounting, budgeting, planning, billing, etc. (see chart below).

FINANCIAL MANAGEMENT SYSTEM/SUBSYSTEM	CENTRAL DESIGN AGENCY			
	CASDO	CENO	FAC	NSDD
GENERAL LEDGER	X	X	X	X
COST ACCOUNTING	X	X	X	X
ACCOUNTS PAYABLE	X	X	X	X
ACCOUNTS RECEIVABLE	X	X	X	X
BUDGET/PLANNING	X	X	X	X
PAYROLL/LABOR DISTRIBUTION	X	X	X	X
PLANT ACCOUNTING	X			
FUNDS/RESOURCES		X	X	
BILLING		X	X	
FINANCIAL TRANSACTION HISTORY			X	

Although these are not all of the duplication efforts associated with this type of organizational and operating environment, it is indicative of why the Navy is being criticized for the management of financial systems development and maintenance of financial systems. For the purpose of this feasibility study these CDA and NIF accounting redundancies were the focal points of the NAVSUP investigation.

It appears that the management philosophy for decentralized financial systems design is an outgrowth of the implementation of the various ADP systems and could be considered outdated in today's operating environment. The fact that each CDA must go through essentially the same processes for financial systems design indicates that a significant amount of redundancy can be either eliminated or minimized by consolidating/standardizing financial management CDA functions. It is anticipated that resultant benefits in savings will accrue to the Naval Material Command. Additionally, it is expected that corollary tangible and intangible savings exist in the support activities. For example, each functional group has a separate NIF handbook detailing their accounting and reporting procedures. These handbooks are written, prepared and published under the auspices of the Navy Comptroller's Office. A single CDA could obviate the need for extensive separate publications and the attendant personnel and non-personnel resources utilized in duplicating efforts. This is but one example that can result in economies of scale in a single CDA environment. Further, in the long term this CDA could work towards the design of a single NIF financial ADP system.

ANALYSIS

Data used for this summary analysis comes from both primary and secondary sources. Primary sources include on-site visits, personal interviews, and questionnaire responses. Secondary sources include information extracted from headquarters-type manuals, group activity handbooks, and systems documentation.

A survey questionnaire of financial management CDA functions in support of NIF activities was sent to four CDAs for response: CADSO, CENO, MSDD, and NAVFAC Code 151. These four CDAs are responsible for the financial management functions at 30 of the 50 NIF activities. From the answers received on the questionnaire it became obvious to the study group that there exists similarity and duplication of financial management systems support and development functions within the NIF community. A summary of the data received is provided, as follows.

CDA	NUMBER OF FM SYSTEMS/ FM PROGRAMS	EQUIPMENT	NUMBER OF FM INTERFACE SYSTEMS	INTERFACE MEDIUMS
CASDO	8/174	HONEYWELL 6060 series	8	TAPE
CENO	6/105	HONEYWELL 2000 series	8	TAPE
FAC	19/169	HONEYWELL 200 series BURROUGHS 1865 series BURROUGHS 3500 series	7	TAPE
MSDD	8/84	BURROUGHS 3500/4700 series	14	TAPE/ DISK/ CARD*

* all interfaces are tape except for one disk interface and one card interface

All CDAs have standard Management Information Systems (MIS) installed at the activities under its individual cognizance. There are a total of 41 financial management systems/subsystems at these activities which utilize a total of 532 financial application programs. All subject programs are written in Common Business Oriented Language (COBOL) and, although configured differently, are run on either a Burroughs or a Honeywell machine. All financial management systems/subsystems are, for the most part, tape-oriented. The fact that the systems operate in a tape-oriented, sequential processing environment will facilitate financial and non-financial (e.g., production systems) interfaces. Personnel costs associated with CDA MIS' are as follows:

CDA	CDA MANAGEMENT STRUCTURE	FM DEV. PERSONNEL	FM PERSONNEL COSTS	SYSTEM
CASDO	Decentralized	2.5	$ 73,000	SHIPYARDSMIS
CENO	Centralized	20.0	528,000	NOMIS
FAC	Centralized	1.0	34,000	PWCMS
MSDD	Centralized	24.0	604,000	NIFMS/NIMMS
TOTAL		47.5	$1,239,000	

Two CDAs have a significant amount of personnel resources currently engaged in maintaining the financial management systems. There are approximately 47 systems development located at the four CDAs. Annual salary expenditures are in excess of $1.2 million. These totals do not include all personnel actually performing systems development work. For example, the NARFs have an additional 14 people involved in defining users requirements for the development of an improved Naval Industrial Material Management System (NIMMS). These personnel are not identified as part of the current Management Systems Development Directorate (MSDD) CDA staff. Further, these totals only include the professional and technical staff (systems analysts,

programmers, accountants, etc.) and do not include the systems support personnel, such as secretaries and clerks. Therefore, without additional analysis it is not possible to identify all resources currently devoted to financial management systems development.

All CDAs maintain dynamic rather than static systems. There is a considerable amount of on-going financial management systems development work in progress on all resident systems under the CDAs' cognizance. The total developmental effort devoted to these systems cannot be readily ascertained from the information collected during the course of this study. However, it can be seen form the following matrix that the estimated resources are at least 113 manyears and about $2.5 million dollars. The potential for cost avoidance/cost savings in this area appear to be substantial.

CDA	PLANNED OR PRESENT PROJECTS UNDER DEVELOPMENT	% OF COMPLETION	ESTIMATED MANYEARS ALLOCATED	ESTIMATED DEVELOPMENT COSTS	SYSTEM
CASDO	5	0	46.25	$2,460,540	SHIPMIS
CENO	2	0	18.50	109,000	NOMIS
FAC	9	0	undetermined	471 mandays	PWCMS
MSDD	22	15	49.00	undetermined	NIFMS/NIMMS

In addition, it has been established that all NIF activities produce products of provide services on the basis of reimbursable work orders, e.g., work requests, project orders, etc. A customer order record is established which provides the authority for the appropriate department to set up job order numbers and commit funds. The job order number is used to reflect all labor, material, overhead, and other costs that will be charged against a specific customer order record. Billings of these costs to the appropriate

sponsor are effected during the activity's normal billing cycle. Billings are accomplished both manually and automatically, depending on activity capability.

The NIF activities have a common ADP data element base in its financial management system. All NIF acitivities are required, by law, to submit periodic financial statements to higher authority; that is, to the Navy Accounting and Finance Center (NAFC), the Comptroller of the Navy (NAVCOMPT), and to the parent Systems Command. All NIF activities report financial management information over the Automatic Digital Network (AUTODIN) reporting system via punched card. Standardization of data elements is mandatory since consolidation of data by activity group and total Navy is effected mechanically by computer. Although each group of activities provide differert services or products to its customers, the objectives of the financial management systems are the same: to provide an accurate accounting of the cost associated with providing the services or products and to better control resources, such as manpower and material.

It is evident that the potential synergistic effects in consolidating/standardizing CDAs are significant and advantageous. The design, development, and maintenance functions under a single CDA concept will, intuitively, allow the Department of the Navy to utilize its increasingly scarce resources in the most effective and efficient manner possible.

V. ALTERNATIVES

Although there were other options studied, the following three alternatives were considered by the study group as being the most viable alternatives coincident with the objectives of the study

Alternative 1. Maintain status quo. Do not consolidate NIF financial management systems under a single CDA or a single management office.

Alternative 2. Establish a CDA management office. This office will be responsible for coordinating the design, development and maintenance of all existing NIF financial management systems.

Alternative 3. Establish a single CDA with a single management office. This CDA will be responsible for the design, development and maintenance of all future financial management systems within the NIF community and responsible for the CDA functions of all existing NIF financial management systems.

It was recognized that there are certain advantages and disadvantages inherent in each considered alternative. The most cogent of these are displayed graphically in the following charts.

Alternative 1.

Maintain status quo. Do not consolidate NIF financial management systems under a single CDA or a single management office.

ADVANTAGES	DISADVANTAGES
1. current operations continued without disruptions	1. systems development efforts redundant
2. project budget levels unchanged	2. standardization efforts hindered
3. current customer relationships unchanged	3. inefficient utilization of resources
	4. GAO requirements unsatisfied
	5. costs remain at current or higher levels
	6. almost impossible to make timely changes to financial processes

Alternative 2.

Establish a CDA management office. This office will be responsible for coordinating the design, development and maintenance of existing NIF financial management systems.

ADVANTAGES

1. operating procedures unchanged
2. provides for limited degree of standardization in systems development and maintenance efforts
3. allows for centralization of policy guidance and interpretation

DISADVANTAGES

1. coordination of multiple CDAs and financial management systems more complex
2. redundant systems development and maintenance efforts
3. less opportunity to reduce total operating and support costs
4. almost impossible to make timely changes to financial processes

Alternative 3.

Establish a single CDA with a single management office. The single CDA will be responsible for the design, development and maintenance of all financial management systems within the NIF community.

ADVANTAGES

1. centralized policy guidance and interpretation
2. satisfies GAO requirements
3. maximizes economies of scale in the utilization of resources
4. establishes a base of knowledge for future standardization efforts
5. makes timely changes to financial processes possible

DISADVANTAGES

1. disruption of current customer-sponsor relationships
2. organizational and functional transition difficulties
3. probable loss of key systems personnel

VI. CONCLUSIONS

Alternative 1 is a continuance of the present multiple managed, multiple CDA policy and will require operating expenses at current or increasing levels. It will not lead to any savings for personnel, equipment, or administrative costs.

Alternative 2 is the establishment of a single office to manage the CDAs and will produce a significant reduction in the level of administrative/management costs. It will not effect any savings for operating costs in the CDAs.

Alternative 3, a singly managed CDA for NIF financial applications, is judged to be the most cost effective alternative because it will encompass a reduction in CDA operating costs in addition to lower administrative/ management costs. Additionally, it will prove to be more administratively efficient for the coordinating of financial design, development, and maintenance projects.

VII. RECOMMENDATION

Alternative 3 is tentatively recommended. However, it is a qualified recommendation because there is not a valid cost benefit analysis which will support the recommendation. An economic analysis has not been performed because it became obvious to the study group that portions of the information obtained from both primary and secondary sources appear to be ambiguous and inconclusive.

In order to provide the quantitative factors necessary to properly judge alternative 3, it is further recommended that the Naval Audit Service, private contractor or other independent agent be commissioned to perform an in-depth study regarding the resources associated with consolidation/ standardization of the NIF CDA financial management functions.

The independent study should provide an economic analysis of the financial management CDA functions in the NIF community with the function and attributable resources identified. An outside source should be able to provide unbiased information for decision making purposes.

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